

Multiplying Radical Expressions

Simplify.

$$\begin{aligned} 1) \quad 3\sqrt{12} \cdot \sqrt{6} &= 3\sqrt{72} \\ &= 3\sqrt{36 \cdot 2} \\ &= 3 \cdot 6\sqrt{2} \\ &= 18\sqrt{2} \end{aligned}$$

$$2) \quad \sqrt{5} \cdot \sqrt{10}$$

$$\begin{aligned} 3) \quad \sqrt{6} \cdot \sqrt{6} \\ \sqrt{36} \\ 6 \end{aligned}$$

$$4) \quad \sqrt{5} \cdot -4\sqrt{20}$$

$$\begin{aligned} 5) \quad -4\sqrt{15} \cdot -\sqrt{3} &= 4\sqrt{45} \\ &= 4\sqrt{9 \cdot 5} \\ &= 4 \cdot 3\sqrt{5} \\ &= 12\sqrt{5} \end{aligned}$$

$$6) \quad \sqrt{20x^2} \cdot \sqrt{20x}$$

$$\begin{aligned} 7) \quad \sqrt{15n^2} \cdot \sqrt{10n^3} &= \sqrt{150n^5} \\ &= \sqrt{25 \cdot 6n^4 \cdot n} \\ &= 5n^2\sqrt{6n} \end{aligned}$$

$$8) \quad \sqrt{18a^2} \cdot 4\sqrt{3a^2}$$

$$\begin{aligned} 9) \quad -3\sqrt{7r^3} \cdot 6\sqrt{7r^2} &= -18\sqrt{49r^5} \\ &= -18 \cdot 7\sqrt{r^4 \cdot r} \\ &= -126r^2\sqrt{r} \end{aligned}$$

$$10) \quad -4\sqrt{28x} \cdot \sqrt{7x^3}$$

$$\begin{aligned} 11) \quad \sqrt{3}(5 + \sqrt{3}) &= 5\sqrt{3} + \sqrt{3} \cdot \sqrt{3} \\ &= 5\sqrt{3} + 3 \end{aligned}$$

$$12) \quad 2\sqrt{5}(\sqrt{6} + 2)$$

$$\begin{aligned} 13) \quad -3\sqrt{3}(2 + \sqrt{6}) &= -3 \cdot 2\sqrt{3} - 3\sqrt{18} \\ &= -6\sqrt{3} - 3\sqrt{9 \cdot 2} \\ &= -6\sqrt{3} - 3 \cdot 3\sqrt{2} \\ &= -6\sqrt{3} - 9\sqrt{2} \end{aligned}$$

$$14) \quad \sqrt{3}(-5\sqrt{10} + \sqrt{6})$$

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15) $-2\sqrt{15}(-3\sqrt{3} + 3\sqrt{5})$

$$\begin{aligned} &6\sqrt{45} - 6\sqrt{75} \\ &6\sqrt{9 \cdot 5} - 6\sqrt{25 \cdot 3} \\ &6 \cdot 3\sqrt{5} - 6 \cdot 5\sqrt{3} = 18\sqrt{5} - 30\sqrt{3} \end{aligned}$$

16) $5\sqrt{42x}(4 + 4\sqrt{7x})$

17) $\sqrt{14x}(3 - \sqrt{2x})$

$$\begin{aligned} &3\sqrt{14x} - \sqrt{28x^2} \\ &3\sqrt{14x} - \sqrt{4 \cdot 7x^2} \\ &3\sqrt{14x} - 2|x|\sqrt{7} \end{aligned}$$

18) $\sqrt{6n}(7n^3 + \sqrt{12})$

19) $\sqrt{3v}(\sqrt{6} + \sqrt{10})$

$$\begin{aligned} &\sqrt{3v \cdot 6} + \sqrt{3v \cdot 10} \\ &\sqrt{9 \cdot 2v} + \sqrt{30v} \\ &3\sqrt{2v} + \sqrt{30v} \end{aligned}$$

20) $\sqrt{21r}(5 + \sqrt{7})$

21) $(-2\sqrt{3} + 2)(\sqrt{3} - 5)$

$$\begin{aligned} &-2\sqrt{9} + 2\sqrt{15} + 2\sqrt{3} - 10 \\ &-2 \cdot 3 + 2\sqrt{15} + 2\sqrt{3} - 10 \\ &2\sqrt{15} + 2\sqrt{3} - 16 \end{aligned}$$

22) $(5 - 4\sqrt{5})(-2 + \sqrt{5})$

23) $(-2 - 3\sqrt{5})(5 - \sqrt{5})$

$$\begin{aligned} &-10 + 2\sqrt{5} - 15\sqrt{5} + 3\sqrt{25} \\ &-10 - 13\sqrt{5} + 3 \cdot 5 \\ &5 - 13\sqrt{5} \end{aligned}$$

24) $(\sqrt{5} - \sqrt{3})(\sqrt{5} + \sqrt{3})$

25) $(5\sqrt{2x} + \sqrt{5})(-4\sqrt{2x} + \sqrt{5x})$

$$\begin{aligned} &-20\sqrt{4x^2} + 5\sqrt{10x^2} - 4\sqrt{10x} + \sqrt{25x} \\ &-20\sqrt{4x^2} + 5|x|\sqrt{10} - 4\sqrt{10x} + 5\sqrt{x} \\ &-40|x| + 5|x|\sqrt{10} - 4\sqrt{10x} + 5\sqrt{x} \end{aligned}$$

26) $(-3\sqrt{3k} + 4)(\sqrt{3k} - 5)$

27) $(5 + 4\sqrt{3})(3 + \sqrt{3})$

$$\begin{aligned} &15 + 5\sqrt{3} + 12\sqrt{3} + 4\sqrt{9} \\ &15 + 17\sqrt{3} + 4 \cdot 3 \\ &15 + 17\sqrt{3} + 12 \\ &27 + 17\sqrt{3} \end{aligned}$$

28) $(3\sqrt{2} + \sqrt{5})(\sqrt{2} - 3\sqrt{5r})$